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FILE LAST UPDATED: 7 Nov 2005 (20051107/ED)


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=> solid (a) state (a) shear (a) pulverization
         986955 SOLID
         277787 SOLIDS
        1192182 SOLID
                  (SOLID OR SOLIDS)
        1272978 STATE
         495479 STATES
        1566757 STATE
                  (STATE OR STATES)
         135319 SHEAR
           1099 SHEARS
         135976 SHEAR
                  (SHEAR OR SHEARS)
           7539 PULVERIZATION
             22 PULVERIZATIONS
           7553 PULVERIZATION
                  (PULVERIZATION OR PULVERIZATIONS)
L1           52 SOLID (A) STATE (A) SHEAR (A) PULVERIZATION

=> solid state shear pulverization
         986955 SOLID
         277787 SOLIDS
        1192182 SOLID
                  (SOLID OR SOLIDS)
        1272978 STATE
         495479 STATES
        1566757 STATE
                  (STATE OR STATES)
         135319 SHEAR
           1099 SHEARS
         135976 SHEAR
                  (SHEAR OR SHEARS)
           7539 PULVERIZATION
             22 PULVERIZATIONS
           7553 PULVERIZATION
                  (PULVERIZATION OR PULVERIZATIONS)
L2           49 SOLID STATE SHEAR PULVERIZATION
                  (SOLID(W)STATE(W)SHEAR(W)PULVERIZATION)

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          11722 EXFOLIAT?
L3            8 L2 AND EXFOLIAT?

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L3   ANSWER 1 OF 8  CAPLUS  COPYRIGHT 2005 ACS on STN
AB   The production of polymer nanocomposites with excellent dispersion of
     nanofillers has proven to be a major challenge using conventional polymer
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processing methods. As a result of commonly poor dispersion of nanofillers, the promise of enhanced properties in nanocomposites has often gone unrealized. We have recently demonstrated that a process called **solid-state shear pulverization** (SSSP) can yield well-**exfoliated** polymer-clay nanocomposites and well-dispersed polymer-multiwall carbon nanotube and polymer-alumina nanoparticle composites. Furthermore, the **exfoliation** of dispersion achieved via SSSP is stable during subsequent melt processing of the nanocomposites made via SSSP. The connection between synergistic macroscopic properties, from modulus to thermal stability to conductivity, and dispersion of nanofiller is illustrated by the results obtained in this study.

ACCESSION NUMBER: 2005:688200 CAPLUS
TITLE: Polymer nanocomposites by pulverization: enhanced properties and dispersion
AUTHOR(S): Kasimatis, Kosmas G.; Nowell, Joseph A.; Dykes, Laura M.; Burghardt, Wesley R.; Ramanathan, Thillaiyan; Brinson, L. Catherine; Torkelson, John M.
CORPORATE SOURCE: Northwestern University, Evanston, IL, 60208-3120, USA
SOURCE: Annual Technical Conference - Society of Plastics Engineers (2005), 63rd, 1965-1969
CODEN: ACPED4; ISSN: 0272-5223
PUBLISHER: Society of Plastics Engineers
DOCUMENT TYPE: Journal; (computer optical disk)
LANGUAGE: English
REFERENCE COUNT: 13 THERE ARE 13 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L3 ANSWER 2 OF 8 CAPLUS COPYRIGHT 2005 ACS on STN
AB A polymer-clay nanocomposite is made by providing a supply of polymer-clay mixture, **exfoliating** the mixture through **solid-state shear pulverization** in the presence of cooling sufficient to maintain the extruded mixture in the solid state during the pulverization, and discharging the resulting **exfoliated** mixture

ACCESSION NUMBER: 2005:394857 CAPLUS
DOCUMENT NUMBER: 142:431257
TITLE: **Exfoliated** polymer-clay nanocomposite and its manufacture
INVENTOR(S): Torkelson, John Mark; Lebovitz, Andrew; Kasimatis, Kosmas; Khait, Klementina
PATENT ASSIGNEE(S): USA
SOURCE: U.S. Pat. Appl. Publ., 11 pp.
CODEN: USXXCO
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2005096422	A1	20050505	US 2003-701067	20031105
PRIORITY APPLN. INFO.:			US 2003-701067	20031105

L3 ANSWER 3 OF 8 CAPLUS COPYRIGHT 2005 ACS on STN
AB Well-**exfoliated** 95 wt%/5 wt% polypropylene-clay nanocomposites were prepared using a novel process called **solid-state shear pulverization** (SSSP). The SSSP method is a continuous process that employs a modified twin-screw extruder that exposes the polymeric system to high shear and compressive forces in the solid state, yielding high levels of dispersion. **Exfoliation** levels was compared by transmission electron microscopy, x-ray diffraction, and crystallization half-times to those achieved via melt extrusion, showing that SSSP yields much better dispersion. The dispersion achieved by SSSP was kinetically stable when the samples were annealed in the melt state over several hours. This indicates that the SSSP-processed nanocomposites can be further processed in the melt without concern for loss of **exfoliation**.

ACCESSION NUMBER: 2004:669997 CAPLUS
DOCUMENT NUMBER: 142:7221
TITLE: Well-**exfoliated**, kinetically stable polypropylene-clay nanocomposites made by **solid-state shear pulverization**
AUTHOR(S): Kasimatis, Kosmas G.; Torkelson, John M.
CORPORATE SOURCE: Dept. of Chemical and Biological Engineering and Dep. of Materials Science and Engineering, Northwestern University, Evanston, IL, 60208-3120, USA
SOURCE: PMSE Preprints (2004), 91, 173-174
CODEN: PPMRA9; ISSN: 1550-6703
PUBLISHER: American Chemical Society
DOCUMENT TYPE: Journal; (computer optical disk)
LANGUAGE: English
REFERENCE COUNT: 11 THERE ARE 11 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L3 ANSWER 4 OF 8 CAPLUS COPYRIGHT 2005 ACS on STN
AB The production of well-**exfoliated** polyolefin-clay nanocomposites has been largely unsuccessful using conventional processes such as twin-screw extrusion. This is because organoclay does not disperse well in non-polar polymers during melt processing. Well-**exfoliated** 95wt%/5wt% polypropylene-clay nanocomposites were prepared using a novel process called **solid-state shear pulverization** (SSSP). The SSSP method is a continuous process that employs a modified twin-screw extruder that exposes the polymeric system to high shear and compressive forces in the solid state, yielding high levels of dispersion. **Exfoliation** levels was compared by transmission electron microscopy, x-ray diffraction, and crystallization half-times to those achieved via melt extrusion, showing that SSSP yields much better dispersion. The dispersion achieved by SSSP was found to be kinetically stable when the samples were annealed in the melt state over several hours. This indicates that the SSSP-processed nanocomposites can be further processed in the melt without concern for loss of **exfoliation**.
ACCESSION NUMBER: 2004:659978 CAPLUS
TITLE: Well-**exfoliated**, kinetically stable polypropylene-clay nanocomposites made by **solid-state shear pulverization**
AUTHOR(S): Kasimatis, Kosmas G.; Torkelson, John M.
CORPORATE SOURCE: Chemical and Biological Engineering, Northwestern University, Evanston, IL, 60208, USA
SOURCE: Abstracts of Papers, 228th ACS National Meeting, Philadelphia, PA, United States, August 22-26, 2004 (2004), PMSE-096. American Chemical Society: Washington, D. C.
CODEN: 69FTZ8
DOCUMENT TYPE: Conference; Meeting Abstract
LANGUAGE: English

L3 ANSWER 5 OF 8 CAPLUS COPYRIGHT 2005 ACS on STN
AB Anal. by electron microscopy, x-ray diffraction/scattering and DSC reveals that well-**exfoliated** states can be achieved in polypropylene (PP)/clay nanocomposites using **solid-state shear pulverization**. These **exfoliated** states cannot be achieved in PP/clay nanocomposites by melt processing. The nanocomposites remain well-**exfoliated** even after 1.5-2 h of annealing in the melt state. Thus, even if an **exfoliated** state is not thermodynamically favored, it is kinetically stable over long times in the melt state.
ACCESSION NUMBER: 2004:488331 CAPLUS
DOCUMENT NUMBER: 142:198884
TITLE: Kinetic stability of the well-**exfoliated** state in polypropylene-clay nanocomposites made by **solid-state shear pulverization**
AUTHOR(S): Kasimatis, Kosmas G.; Torkelson, John M.

CORPORATE SOURCE: Department of Chemical and Biological Engineering, Department of Materials Science and Engineering, Northwestern University, Evanston, IL, 60208-3120, USA
SOURCE: Annual Technical Conference - Society of Plastics Engineers (2004), 62nd(Vol. 2), 1503-1507
CODEN: ACPED4; ISSN: 0272-5223
PUBLISHER: Society of Plastics Engineers
DOCUMENT TYPE: Journal
LANGUAGE: English
REFERENCE COUNT: 18 THERE ARE 18 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L3 ANSWER 6 OF 8 CAPLUS COPYRIGHT 2005 ACS on STN
AB Producing a polymer-clay nanocomposite comprises providing a supply of melt-extruded polymer-clay mixture, **exfoliating** the mixture through **solid-state shear pulverization** in the presence of cooling sufficient to maintain the extruded mixture in the solid state during the pulverization, and discharging the resulting **exfoliated** mixture Producing a polymer hybrid nanocomposite comprises dispersing a clay component or other reinforcing material throughout a polymer matrix by **solid-state shear pulverization** of a polymer mixed with the clay component. The initial melt-extrusion step thoroughly mixes the polymer-clay mixture, yielding an intimate contact of polymer and clay; and after the mixture is thoroughly mixed (but not yet **exfoliated**), **solid-state shear pulverization** yields a high level of **exfoliation** and dispersion and improved nanocomposite properties.
ACCESSION NUMBER: 2004:428849 CAPLUS
DOCUMENT NUMBER: 141:8200
TITLE: Producing **exfoliated** polymer-clay nanocomposite and polymer-clay nanocomposite product
INVENTOR(S): Torkelson, John M.; Lebovitz, Andrew H.; Kasimatis, Kosmas; Khait, Klementina
PATENT ASSIGNEE(S): Material Sciences Corporation, USA
SOURCE: PCT Int. Appl., 20 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2004043663	A2	20040527	WO 2003-US34892	20031105
WO 2004043663	A3	20040812		

W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW
RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG

PRIORITY APPLN. INFO.: US 2002-423591P P 20021105

Corresponding WO

L3 ANSWER 7 OF 8 CAPLUS COPYRIGHT 2005 ACS on STN
AB **Solid-state shear pulverization** (SSSP) was compared in terms of dispersed-phase sizes with melt processing methods in producing blends of polystyrene with other polymers (e.g. PE) as well as nanocomposites of polypropylene and organoclays. To elucidate the mechanism of SSSP, fluorescence-detector GPC was used to detect interpolymer radical coupling in several polymer blends, thought to originate from chain scission during blend pulverization.
ACCESSION NUMBER: 2003:222564 CAPLUS
DOCUMENT NUMBER: 138:322021

TITLE: Innovative process for compatibilizing polymer blends and producing well-**exfoliated** polymer nanocomposites: **Solid-state shear pulverization**
AUTHOR(S): Lebovitz, Andrew H.; Kasimatis, Kosmas; Torkelson, John M.
CORPORATE SOURCE: Dept. of Chemical Engineering, Northwestern University, Evanston, IL, 60208-3120, USA
SOURCE: PMSE Preprints (2003), 88, 96-97
CODEN: PPMRA9; ISSN: 1550-6703
PUBLISHER: American Chemical Society
DOCUMENT TYPE: Journal; (computer optical disk)
LANGUAGE: English
REFERENCE COUNT: 14 THERE ARE 14 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L3 ANSWER 8 OF 8 CAPLUS COPYRIGHT 2005 ACS on STN
AB A novel, continuous, mech. process called **solid-state shear pulverization** (SSSP) is capable of overcoming long-standing problems associated with melt-state processing of polymer blends and nanocomposites. In comparison to melt-state processing, SSSP is capable of producing finer dispersions of a minor-phase polymer in a matrix polymer. Examples will be given both where melt-processing yields large average dispersed-phase particle diamters, Dn, (an 85/15 polystyrene (PS)-polyethylene (PE) wax blend yields Dn=17.5 μ by melt processing but Dn=0.7 μ by SSSP)and where it yields small Dn (a 90/10 PS/high d. PE blend yields Dn=500 nm by melt processing and 270 nm by SSSP). SSSP also yields compatibilization of immiscible blends such as PS/PE and PS/polymethylmethacrylate, as proven by stability of Dn to static, high-temperature annealing. In contrast, melt-processed blends coarsen under the same annealing conditions. The mol. origin of compatibilization via SSSP is the in situ production of block copolymer resulting from interpolymer radical coupling of macroradicals formed by modest chain scission accompanying SSSP. Finally, well-**exfoliated** polypropylene-clay nanocomposites have been made via SSSP as evidenced by x-ray scattering, transmission electron microscopy, and differential scanning calorimetry.
ACCESSION NUMBER: 2003:185855 CAPLUS
TITLE: Innovative process for compatibilizing polymer blends and producing well-**exfoliated** polymer nanocomposites: **Solid-state shear pulverization**
AUTHOR(S): Lebovitz, Andrew H.; Kasimatis, Kosmas; Torkelson, John M.
CORPORATE SOURCE: Chemical Engineering, Northwestern University, Evanston, IL, 60208, USA
SOURCE: Abstracts of Papers, 225th ACS National Meeting, New Orleans, LA, United States, March 23-27, 2003 (2003), PMSE-057. American Chemical Society: Washington, D. C.
CODEN: 69DSA4
DOCUMENT TYPE: Conference; Meeting Abstract
LANGUAGE: English